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PROTECTION OF TRANSPORT STRUCTURES FROM NATURAL EMERGENCIES

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Annotation

In the mountainous and foothill areas of the republic in spring and late autumn, heavy rains and floods cause landslides on the slopes, landslides as a result of coagulation of most of the land. At the same time, careless grazing of livestock on the slopes, felling of trees in the foothills, as a result of strong floods, the water flow on the slopes flows downhill, washing away all the debris, rocks and sand, endangering the movement of passenger and freight trains. . This article aims to protect against the above-mentioned situations, to ensure the safety of transport facilities. At the same time, there is a discussion of natural disasters in the country and their impact on the economy. In particular, the lines of railway transport passing through mountainous and foothill areas and the stations built there, power transmission devices and all devices that organize the movement of trains, traffic lights, electric lights, tunnels, bridges and similar railway buildings and structures, as well as economic enterprises, mountains. proposals and comments on protection of settlements located on the slopes from floods and landslides.

Аннотации

В горных и предгорных районах республики весной и поздней осенью сильные дожди и наводнения вызывают оползни на склонах, оползни в результате коагуляции большей части земель. При этом неосторожный выпас скота на склонах, вырубка деревьев в предгорьях, в результате сильного паводка водный поток на склонах стекает вниз, смывая весь мусор, камни и песок, создавая опасность для передвижения пассажирские и грузовые поезда. . Данная статья направлена на защиту от вышеперечисленных ситуаций, обеспечение безопасности транспортных средств. В то же время обсуждают стихийные бедствия в стране и их влияние на экономику. В частности, линии железнодорожного транспорта, проходящие через горные и предгорные районы, и построенные там станции, устройства передачи электроэнергии и все устройства, организующие движение поездов, светофоры, электрические фонари, туннели, мосты и аналогичные железнодорожные здания и сооружения, а также а также хозяйственные предприятия, гор.предложения и комментарии по защите населенных пунктов на склонах от наводнений и

Ключевые слова: железная дорога**,** ветки, песок, камни, сильные сели, размыв, оползни, обрушивание.
Keywords: railway, brushwood, sand, stones, heavy mudflows, erosion, landslides, collapse.

The protection of transport facilities in the event of natural disasters will be the main basis for the uninterrupted operation of these vehicles and the safe handling of household goods. It is known that the Tashguzor-Boysun-Kumkugon railway line connecting the Republic with the south passes through mountainous areas. There are also facilities on the Angren-Pop route. There are also bridges over several cliffs in these areas. A railway line passed through the mountainous area, surrounded on both sides by mountains. This is due to the arrival of strong floods and landslides in early spring and late autumn, which closes the road, causing several trains to stand, which disrupts the entire railway traffic schedule.

There fore, it is necessary to take precautionary measures against floods and landslides in these areas where vehicles move [1,3,5,7].

When designing anti-flood structures, it is necessary to know the basic parameters of flood flow. These include: volumetric weight of the flood and the degree of saturation of solids, flood velocity, maximum flow and volume, construction of a granulometric curve of solid phase particles of the flood, the maximum size of flood solids, etc. [2].

Volumetric severity and degree of saturation of solids. The volumetric weight of the flood gsel is used to determine its other parameters, including the calculation of the dynamic effect of the flood on the structure.

Volumetric weight of the flood

$$\Gamma_{flood} = (\gamma_{water} + \gamma_m \cdot S_{water})/(1 + S_{water}) \qquad (1)$$

where $\gamma_{water} = 1\ m/м^3$ volumetric weight of water,

$\gamma_T = 2,5...2,8\ m/м^3$ - bulk density of solids,

Water is the ratio of the volume of solids of the flood to the volume of the liquid in the flood, determined by the following formula

$$S_{water} = W_m / W_{water} \qquad (2)$$

where W_m - is the volume of solids in the flood, Wsuv is the volume of the liquid in the flood.

A variety of formulas can be found in the literature on floods [3]. The relationship between the volume and weight concentration (density) of the solids in the mud and the volume weight is expressed as follows:

$$S_{water}\ (\beta 0) = (\gamma_{flood} - \gamma_{water})/(\gamma m - \gamma_{flood})$$
$$S = (\gamma_{flood} - \gamma_{water}) / (\gamma_m - \gamma_{water}) \qquad (3)$$
$$P = \gamma_m \cdot (\gamma_{flood} - \gamma_{water}) / [\gamma_{flood} \cdot (\gamma_m - \gamma_{water})]$$
$$S = \gamma_m \cdot (_{flood} - \gamma_{water})/(\gamma_m - \gamma_{water})$$

where P is the weight concentration of solids in the flood flow, S is the volumetric concentration of solids in the flood flow..

The relationship between them is shown graphically in Figure 1.

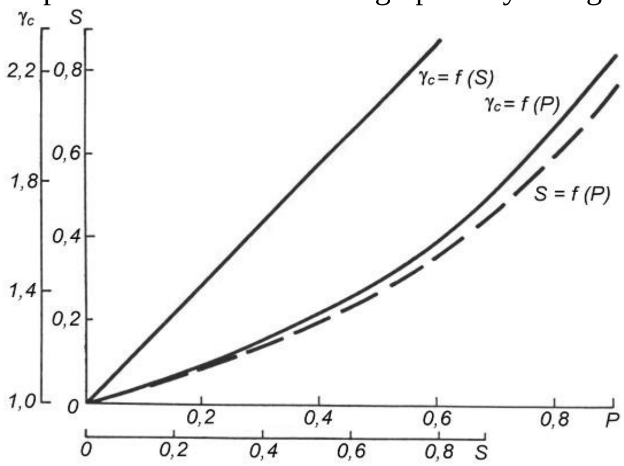

*Figure 1.*The correlation between the volumetric weight of the mud and the volume and weight concentration (density).

The accuracy of the proposed formulas is insufficient, firstly due to the complexity of the flood phenomenon and secondly due to the fact that it is much more difficult to study in field conditions.

For these reasons, the scale shown in Table 1 can be recommended for determining the volumetric weight of the flood for calculations.

Table 1

Determining the volumetric weight of the flood

T / s	Flood basin type	Flood type	Flood substances	The volume of the flood weight γ_c (т/м^3)
1.	The nutritional value of solids is proportional to the nutritional value of aqueous nutrients based on linear and surface erosion mechanism of flood formation (Kopetdag, Fergana Valley)	Not connected	Water-dust, water-sand	1.1 ... 1.3
2.	Formation of all floods mechanism (Crimea, Armenia, Kazakhstan, Central Asia)	Connected and not connected mud	Large stone, mud	1.3 ... 1.5
3.	The mechanism of formation of complex flood (Georgia, Azerbaijan, Zarafshan valley)	Large stone at saturated level connected and unbound mudstone	Large stone, mud	1.5 ... 1.7
4.	Sliding layers and more equilibrium of arrays based on components mechanism of flood formation (eastern Georgia, southern Kazakhstan)	Bound dark mudstone, rock and mud	Large rock, saturated flood	1.7 ... 1.9

The maximum possible volumetric density of flood solids is correlated with the slope I

$$S_{max} = 1,21 \cdot I/(1-2 \cdot I) \qquad (4)$$

*The speed of the flood.*When calculating and designing structures against floods, it will be necessary to determine the processes in the floodplain, to know the flow rate and velocity. Many formulas have been proposed and given in the specialized literature to determine the average flood rate. Most of them are based on the Shezi formula.

- for unconnected flood

$$V_c = 6,5 \cdot R^{2/3} \cdot I^{1/4} / \{[(\gamma_т \cdot \gamma_{сел} - \gamma_т)/(\gamma_т - 1)]^{1/2} + 1\} \qquad (5)$$

where R is the hydraulic radius.

- for connected flood

$$V_c = K_c \cdot [g \cdot H \cdot (i - i_т)]^{1/2} \qquad (6)$$

where Ks is the coefficient of resistance to current,

H – is the depth of the stream,

$g = 9{,}81$ м/с^2 free fall acceleration;

тушиш тезланиши;

i – is the slope of the river,

$i_т$ – residual slope after the passage of the flood flow (minimum boundary slope, if the slope is smaller, the stream can not provide the movement of the flood flow)

$$i_т = f + \upsilon/(\gamma_{flood} \cdot H) \qquad (7)$$

where f is the coefficient of friction, y is the dynamic viscosity.

The flow resistance coefficient Ks is calculated as a function of the relative dimensions of the flood flow substances, i.e. the magnitude of the average diameter of the substances measured by the ratio N to the flow depth d

2 - accepted according to the table.

Table 2

The current resistance coefficient is Ks

d / N	0.025	0.65	0.10	0.20	0.30	0.40	0.50
K_c	7.1	4.85	3.20	1.94	1.32	0.95	0.66

*Maximum flood flow and flow rate.*The maximum flow rate and the volume of runoff are used to determine the capacity of anti-flood structures and the size of the structure (floodplain).

The most reliable way to determine the maximum flood flow is to calculate it based on the footprint in the hydraulics after the flood has passed.

$$Q_{мак} = V_c \cdot \omega \qquad (8)$$

In this case, ω - $H_{мак}$ is the living cross-sectional area corresponding, м^2 .

If it is not possible to measure directly in the hydraulic solution, the formulas used in practice can be used.

Specific consumption of flood

$$q_c = Q_c/B_c \qquad (9)$$

- for connected flood

$$q_c = K_c \cdot H^{3/2} \cdot [g \cdot (i - i_т)]^{1/3} \qquad (10)$$

- for unconnected flood

$$q_c = K_в \cdot H^{3/2} \cdot (\alpha \cdot g \cdot i)^{1/2} \qquad (11)$$

Ks = f (d / H) given above; K_c= f (d/H); $K_в$= f (Δ/H).. In this case, D / H is the relative roughness, which can be determined from Table 3.

Table 3

Quantities of current resistance coefficients

(d / H): (D / H)	0.03	0.05	0.10	0.15
Ks	7.10	4.85	3.20	2.45
Kv	11.88	9.85	7.80	6.65

It should be noted that the accuracy (reliability) of the given formulas is insufficient. Therefore, the exact way to determine the flood flow is to determine the flood volume in the hydraulic solution, it is recommended to determine the flood volume by the same method.

However, flood volume can be estimated using analytical formulas.

$$W = 1000 \cdot H \cdot \alpha \cdot \beta \cdot F \ \ (м^3) \qquad (12)$$

where H is the thickness of the oil formed by the flood;

α is the flow coefficient, α = 0.5 ... 0.7 for high mountain basins; for medium mountain basins α = 0.25 ... 0.5; for low mountain basins α = 0.1 ... 0.25;

β is the volume of floodwaters in 1 m3 of water, β = 0.1 ... 0.7.

If the elapsed time of the flood is accurate, the average flood consumption can be determined by the following formula

$$Q_c = W/T \ \ (м^3/с) \qquad (13)$$

Dimensions of floodplains. The average diameter of the floodplains can be calculated using the following formula

$$d = 0,2 \cdot (\gamma_т \cdot K_н / \mu)^{0,25} \, I^{0,29} \cdot [Q_{10\%}/(g)^{0,5}]^{0,4} \qquad (14)$$

where $\gamma_т$ – is the bulk density of the particles, kG / m3;

μ – is the average density on the live section;

$Q_{10\%}$– stream formation water consumption, m3 / s;

$K_н$ –is the coefficient $K_н$ = 2...15 (average $K_н$ = 4) or

$$K_н = d_{ў\ мак} / d_{ў\ мин} \qquad (15)$$

In this case, the poppy is the average diameter of the largest fraction (d ... 1.8d); do min - the average diameter of a small fraction (d ... 0.45d).

The size of the largest rocks that are flooded depends on the speed of the flood and the flow density

- for unconnected floods

$$d_{мак} = 0,04 \cdot V_c^2 \qquad (16)$$

- for connected floods

$$d_{мак} = m \cdot V_c^{2,4} + d_0 \qquad (17)$$

where Vc is the flood velocity, m / s; m is the coefficient depending on the viscosity and density of the flood,

d_0 is the limiting dimension of the solid that can hold the mass of the mud at rest, m = 0.07, d_0 = 0.1 m for the connected muds with low viscosity; m = 0.13, d_0 = 0.2 ... 0.3 m for mudflows of medium thickness; m = 0.2, d_0> 0.5 m for very thick (paste-like) connected floods.

Studies have shown that the dmak determined under field conditions is greater than that determined using the given formulas. Therefore, one of the most reliable (accurate) methods is to determine the flood parameters in the field, from the flood trace.

In this way, flood parameters are determined and the safety of railway transport routes is forecasted.

REFERENCES

1. Uzbekistan railway. Tekushchaya version. Versions, proven 3 September 2017 g. Internet materials.

2. Boqiev M., Qodirova M. "Hydrogeological structures against floods". T.2018 y. TIMI.

3. Khamidov AN "Formation of floods, their negative consequences and measures to combat them." TIMI 2018 y.

4. 1999 of the Republic of Uzbekistan. Law of August 20 "On protection of the population and territories from natural and man-made emergencies." T.1999 y.

5. Rizametova I. Newspaper "Temiryolchi" 7.11.2019 ”25 let stalnogo sozidaniya: slavnaya istoriya, vesomyy potentsial, unikalnыe vozmojnosti”. Information on the achievements of the Uzbek railways.

6. Makkambaev P.A., Razikov R.S. «Chrezvычaynые situatsii i grazhdanskaya zashita na jeleznodorojnom transporte» T. TashIIT 2018

7. Khokhlov A.F. "Ensuring the resilience of the functioning of railway transport in critical situations." Author's abstract of the dissertation for the degree of candidate of technical sciences. Moscow-2005.

8. On measures to prevent emergency situations associated with flood, mudflow, avalanche and landslide phenomena, and to eliminate their consequences: Resolution of the President of the Republic of Uzbekistan dated February 19, 2007 No. PP-585 [Electronic resource]. - Access mode: http: //lex.uz/pages/getpage.aspx? lact_id1132317. - Date of access: 01.12.2017

9. Usmanov S.R. "Actual problems of protection from hazardous geological processes"

10. Instructions for the design and construction of anti-mudflow protective structures: SN 518-95:

11. Niyazmetov S.S. "Methodology for calculating and designing anti-landslide structures for the protection of road subgrade"

12. “Uzbekiston temir yllari” Statistical data for the I quarter of 2020.

13. Yuldasheva D.F. "Ensuring the safety of vehicles in mountainous conditions (for example, the pass" Kamchik ") Dissertation work of master student T.TAI. 2013 g.

14. Popov IA "Improving safety in emergency situations on railway transport using mobile radio communication systems" Dissertation work. M. 2018.

15. Fleishman S.M., Perov V.F. Sat down: (Study guide). - M .: Moscow State University, 1986 .-- 120 p.