

## REVIEW

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**REVIEW OF THE MONOGRAPH “EMBANKMENT DAMS  
IN THE PERMAFROST ZONE OF RUSSIA” BY R.V. ZHANG, S.A. VELIKINA,  
G.I. KUZNETSOVA, N.V. KRUK****O.I. Alekseeva***Melnikov Permafrost Institute SB RAS,  
36, Merzlotnaya str., Yakutsk, 677010, Russia; o.i.alekseeva@mpi.ysn.ru*

In a review of the monograph “Embankment Dams in the Russian Permafrost Zone” by R.V. Zhang, S.A. Velikina, G.I. Kuznetsova, N.V. Kruk, the main results of generalization of the experience in the construction of embankment dams and the field studies of the temperature regime of hydroelectric facilities in the permafrost zone of Russia are considered

*Hydraulic facilities, northern hydraulic engineering, climate changes, geocryological monitoring*

In November 2019, the Academic Publishing House “Geo” (Novosibirsk) published a monograph “Embankment Dams in the Russian Permafrost Zone” by R.V. Zhang, S.A. Velikina, G.I. Kuznetsova, N.V. Kruk. The initiator and ideological inspirer of that work is Rudolf Vladimirovich Zhang, a specialist in the field of permafrost engineering, an Honored Scientist of Russia, who has devoted his whole life to the researching of hydraulic facilities in Yakutia and adjacent territories. The book contains brief biographical information about him and his co-authors. Under the leadership of R.V. Zhang, the team of authors has summarized the unique materials of mainly Russian experience in the design, construction and operation of hydraulic facilities in the difficult engineering and geocryological conditions of the permafrost zone, trying to link the research results with current changes in the global climate, to demonstrate its effect on the stability of engineering structures and the state of permafrost.

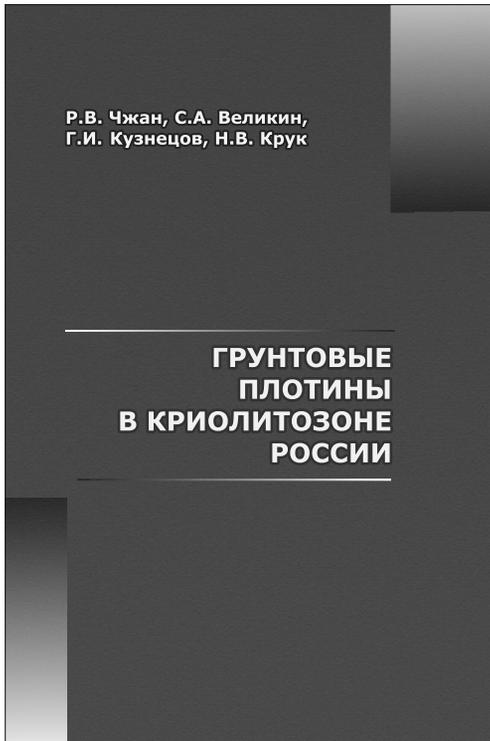
The monograph, consisting of six chapters and four appendices, presents materials on the construction and operation of embankment dams in the permafrost zone of Russia from 1940 to the present. A brief description of the permafrost zone at the present stage, the construction experience, basic safety concepts and geocryological monitoring of embankment dams in connection with climatic change are given. The ecological and nature protection aspects of embankment dams and special enclosing dams are presented.

The field study results of the formation of the cryogenic-temperature regime of the power and water management facilities, which are the basis of the static and seepage stability of hydropower systems,

have been analyzed. The principles of operation of embankment dams in the permafrost zone, as well as the ecological and nature protection aspects of hydraulic engineering in a changing climate have been considered. The role of the geocryological monitoring and the system of its organization with the using of geophysical methods which allow early detection of the prerequisites for the beginning of seepage in a cryogenic environment have been analyzed. Recommendations for the construction and operation of special hydraulic facilities – the tailing dumps in permafrost conditions have been proposed. The article presents innovative designs on the construction of dams by the method of borehole hydraulic production and the proposals for the increasing of the embankment dam stability using the cryogenic resources of the Earth.

The Conclusion notes that at the cost of great intellectual and financial efforts in Russia, a special industrial direction has been formed – the northern hydraulic engineering, within the framework of which the principles and technologies for the construction of hydraulic facilities in difficult permafrost conditions have been developed. For the first time in the world hydraulic engineering practice, most of such construction and operational complexes have been developed and implemented by Russian engineers.

With a variety of natural and climatic conditions in the northern territories in which the hydropower facilities are built and operated, for their successful operation it is necessary to use a set of measures specially developed for these regions. The main condition for the successful operation of hydraulic facilities is the observance of permafrost principles (thawed or



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Zhang, R.V., Velikin, S.A., Kuznetsov, G.I., Kruk, N.V., 2019. Embankment Dams in the Russian Permafrost Zone / D.M. Shesternev (Ed.). Academic Publishing House “Geo”, Novosibirsk, 427 pp.

frozen) using the embankment and foundation materials of dams as an impervious barrier. Moreover, the seepage stability of dams is often achieved only if the embankment and foundation are preserved in a frozen state. Moreover, the filtration stability of dams is often achieved only if the ground of their body and foundation are preserved in a frozen state.

The Conclusion also expresses concern about the fact that the updating of regulatory documents in that area is taking place at a low scientific level. Today, there is an urgent need to bring the PSs and SNiPs in line with federal laws on the safety of hydraulic facilities.

The reference bibliography used in writing of the monograph consists of 418 titles. It contains all the main scientific monographs of the luminaries of hydraulic engineering, including 20 publications by R.V. Zhang, articles in journals, patents for inventions and utility models, regulations, recommendations, manuals, reference books and reports on vari-

ous aspects of hydraulic engineering. Such a topical bibliographic summary is very useful, especially for young researchers who decide to devote themselves to hydraulic engineering.

The independent value of the monograph is represented by the Appendices, which contain a very important unique factual material: the layout of embankment dams in the permafrost zone of Russia; passports and descriptions of the current technical condition of 51 embankment dams in the Krasnoyarsk Krai, the Republic of Sakha (Yakutia), the Magadan Oblast and the Chukotka Autonomous Okrug, as well as the passports of 30 water-storage reservoirs for the power generation, drinking and industrial purposes.

Undoubtedly, the presented monograph will find its readers among the hydraulic engineers, researchers, specialists and managers of economic entities, who design, build and operate the waterworks facilities in the permafrost zone.

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