DISCUSSIONS

EDITOR’S NOTE

With the publication of L. A. Zolotov, I. N. Ivashchenko, and D. B. Radkevich’s article "Practical Quantitative Evaluation of the Safety Level of Operating Hydraulic Structures" and D.V. Stefanishin’s article "Evaluation of the Standard Safety of Dams on the Basis of Risk Criteria," the editor continues the discussion of the problem of the safety of hydraulic structures. Aging of our hydraulic structures (HSs), the majority of which have been operating for more than 30 years, makes the problem of safety quite urgent.

The need to take into account the initial information diverse in character and completeness as well as the exceptional diversity of the operating conditions of HSs hamper a formalized evaluation of the level of their safety. The suggestions expressed in the first of the articles being published are not universal and indisputable. Especially hazardous is the formal use of the formulas given in the article — the use of any of them in a particular case should be preceded by a discussion of experts participating in inspections of HSs.

Unlike operating HSs, the use of calculation methods for evaluating the safety level of planned HSs, including probabilistic calculations, used in the second of the articles being published is more appropriate and prospective. The results given by the author indicate that the probability of occurrence of a limit state of HSs allowed by the current standards is close in value to the probability estimated on the basis of the statistics of failures. Thus, with respect to structures of classes III and IV, which composed the bulk of the statistical sample, the standards take into account sufficiently the operating experience gained. At the same time, direct probabilistic calculations are necessary, evidently, when evaluating the safety of unique structures.

The editor invites journal readers to actively participate in discussing the problem under consideration.

PRACTICAL QUANTITATIVE EVALUATION OF THE SAFETY LEVEL OF OPERATING HYDRAULIC STRUCTURES

L. A. Zolotov, I. N. Ivashchenko,
and D. B. Radkevich

Realization of technical and organizational measures to ensure safety of operating hydraulic structures (HSs) is impossible without an objective evaluation of the level of their safety. Safety is usually evaluated on the basis of comparing safety factors taken into account when drawing up the plan and refined during construction, operation, maintenance, and reconstruction with safety factors acting at the time of inspecting the HSs. By safety factors is meant the quantitative and qualitative characteristics of the state of the structure, natural effects, and expected loss from damage or failure of HSs.

The probabilistic approach to an evaluation of the safety of HSs is theoretically prospective. However, with such an approach it is very difficult to take into account the effect of qualitative factors which often play the main role when evaluating the safety of operating (especially "old") HSs. The method of evaluating the safety level proposed in the article set as its task a comprehensive consideration of various quantitative and qualitative safety factors on the basis of reducing them to a single scale ("ranking" of the safety factors).

The safety evaluation of HSs made on the basis of the results of inspection can turn out to be below the required level. Possible causes of such a situation are: 1) changes (compared with the period of developing and approving the project) in the standard evaluations of the state of HSs as a consequence of a change both in the requirements of the standards and regulations, methods of evaluating the state of the structures, and calculation methods and in the level of possible natural effects and properties of the materials and foundation rocks; 2) deviations of the operating conditions and/or monitored

Estimate of the safety of an operating hydraulic structures (HS) 

Fig. 1. Structure of the safety factors and scheme of estimating their effect on the safety of operating HSs.