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ENHANCEMENT OF RUSSIAN STANDARDS AND BUILDING CODES IN THE SPHERE OF THE SAFETY OF HYDRAULIC STRUCTURES

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ABSTRACT

The paper contains information about Russia's state policy to maintain the safety and reliability of hydraulic structures, about legislative acts and standards in the sphere. The structure and hierarchy of building codes and regulations is thoroughly described. The paper also gives country's experience of enhancement and review of federal laws, technical regulations and national standards in the sphere of dams' safety and future plans. Application of Federal laws and technical regulations are shown on a number of case studies, taking into account structure's current life stage: design, operation and rehabilitation.

1. RUSSIAN STATE POLICY IN THE SPHERE OF THE SAFETY OF HYDRAULIC STRUCTURES

1.1 Russian supervisory authorities

Russian state policy in the sphere of maintenance of reliability and safety of hydraulic structures, including large dams, implies the following:

- development of legislative and regulatory documents; it is the function of public authorities;
- fulfilment of mandatory safety and reliability requirements; it is mandatory to owners of hydraulic structures;
- oversight of compliance with mandatory requirements in the sphere of reliability and safety; it is fulfilled by state supervisory officials: Federal Environmental, Industrial and Nuclear Supervision Service of Russia (Rostekhnadzor), Federal Service for Supervision of Natural Resource Usage (Rosprirodnadzor) and the Ministry of Energy. Owners' preparedness for disaster prevention and response is assessed by the Ministry of Emergency Situations (EMERCOM).

1.2 The hierarchy of legislative and regulatory documents

In Russia the following hierarchy of legislative and regulatory documents is adopted:

- Federal laws and technical regulations;
- Government decrees;
- National standards;
- Codes of practice, rules of technical operation of power plants and electricity networks;
- Methodologies, recommendations and regulations;
- Hydraulic structures' operators' local standards.

Hydraulic structures safety legislation in Russia is presented by the Federal Law "On the safety of hydraulic structures" (1997) (Federal Law, 1997) and adopted in accordance with this Federal Law other laws and standard legal acts of the Russian Federation. The following legal acts are currently in force: "The statute for hydraulic structures safety declaring", "The manner of the Russian Register of hydraulic structures formation and management", "The legal code for operation and safety control of the following hydraulic structures: with withdrawn construction permits and operating license; the hydraulic structures subject to conservation, demolition or which have no owner".

It is necessary to mention that since the Federal Law “On the safety of hydraulic structures” was adopted in 1997, a considerable experience has been gained in the sphere of safety assessment of hydraulic structures. The experience of safety declaration made it possible to pay attention of owners to unsolved organizational and maintenance problems and timely repair works and also to make an solve a list of measures aimed to increase reliability and safety of hydraulic structures. The legislature accelerated the deployment of state-of-the-art monitoring systems including automated and diagnostic ones, which was the general idea of safety declaration. Since 1997 safety of about 480 hydraulic structures of industrial and power generation complexes has been enhanced. According to the Russian register of hydraulic structures, today the safety level of hydraulic structures in the country is assessed as follows:

- Normal safety level implies that hydraulic structure has no defects and damages, which can cause its failure, the structure itself is operated according to active codes and regulations; this safety level have 39.4 per cent of structures;
- Reduced safety level implies that hydraulic structure has no defects and damages, which can cause its failure, the structure itself is operated with deviations from active codes and regulations; this safety level have 43.4 per cent of structures;
- Unsatisfactory safety level implies that the first (warning) safety criterion is exceeded; this safety level have 12.5 per cent of structures;
- Dangerous safety level implies that the second (maximum allowable) safety criterion is exceeded and the structure cannot be operated as designed anymore; this safety level has 4.7 per cent of structures.

The issue of safety and reliability management is still urgent. For example, RusHydro PLC developed and deployed on its structures the so-called “Safety and reliability management system”.

Thus, regardless that more than 20 years have passed since adoption of the Federal Law “On the safety of hydraulic structures”, a number of problems and issues is still to be solved.

2. ENHANCEMENT OF REGULATORY AND LEGISLATIVE FRAMEWORK

2.1 Enhancement of legislation

Today a number of Federal laws, technical papers, national standards and governmental acts in the sphere of the safety of hydraulic structures are in the process of being revised and updated.

In 2019 the Government of the Russian Federation adopted the draft act “On voided legislative acts of the Government of the Russian Federation and their specific clauses, on voided of a number of Federal Acts, a number of codes, included obligatory ones...”. The draft act implies that a number of above-mentioned in its heading legislative acts contain outdated requirements or their clauses are duplicated in other documents are to be void. The Act is planned to be put into power on January, 1st, 2021.

The Draft act does not contain any excessive administrative or other limitations and obligations for enterprises and municipalities. It was designed to agree with clauses of the Treaty on the Eurasian Economic Union.

One of the major documents to be updated is The Federal Law “On the safety of hydraulic structures”. Together with the law itself the following legislative acts are to be revised:

- Governmental Act “On revision of a number of governmental acts on the safety of hydraulic structures”;
- Governmental Act “On adoption of Regulation on state monitoring in the sphere of the safety of hydraulic structures”;
- Governmental Act “On adoption of Regulation on prolongation of the design period of operation”;
- Governmental Act “On adoption of types of hydraulic structures and criteria of their division depending on risk categories aimed to simplify state supervision in the sphere of the safety of hydraulic structures”;
- Governmental Act “On safety declaration”;
- Governmental Act “On classification of hydraulic structures”;
- Governmental Act “On procedure of estimation of financial liability for loss caused by failure of hydraulic structures”;
- Governmental Act “On Federal supervision in the sphere of the safety of hydraulic structures”.

When the above-mentioned governmental acts are revised, it will be necessary to revise a number of building codes.

2.2 Enhancement of building codes

As an example let us describe the revision of building code “Hydraulic structures. Basic statements” (SP 58.13330.2012). The document is to be revised due to the following reasons:

- Necessity to update a number of clauses according to experience and practice;

- Extension of the scope of the regulation to all the stages of structures life cycle, including being designed, under construction, in operation, in reconstruction, in elimination or conservation;
- Harmonization of approaches towards design loads;
- Harmonization with other documents.

The revision of SP 58.13330.2012 included the following steps:

- Preparation by JSC Vedeneev VNIIG of the first edition of the building code and the set of documents needed for public inquiry;
- Public inquiry of the first edition;
- Preparation of the summary of comments obtained during public inquiry;
- Preparation of the second edition of the building code and its examination by experts;
- Examination of the document in the Technical committee of standardization;
- Preparation of the summary of comments of experts and the final edition of the document;

The final edition of the building code SP 58.13330.2012 was sent to the Ministry of Regional Development for further approval.

General alterations to the building code include:

- Extension of the scope of the regulation to all the stages of structures life cycle;
- Clarification of approaches towards design of hydraulic structures and requirements of water quality of reservoirs and industrial waste facilities;
- New clauses concerning design and operation of mechanical equipment of hydraulic structures;
- New clauses concerning building materials used for construction of hydraulic structures;
- New clauses concerning rehabilitation of hydraulic structures;
- New clauses concerning assessment of class of responsibility of hydraulic structures;
- New clause concerning reduction of operation period of a hydraulic structure;
- New requirements concerning design water levels of structures used for protection of coastal areas of river mouths, sea bays, lagoons, fjords from cyclic floods and surges.

The revision of building code implied addition of contemporary technologies and limitations for outdated technologies and technical decisions.

One of the most important issues was clarification of requirements to justification of the class of responsibility of hydraulic structures. Today, according to the active Governmental Act, the amount of possible loss caused by failure of a hydraulic structure is estimated within the process of safety declaration and that is why it should be updated at least once in every 5 years depending on safety level. As the result, at least every 5 years the class of hydraulic structures should be updated. As the designer of the structure is not involved in this process, the updated class is not justified by the state expertise. The problem is that all the design parameters of the structure depend on its class (for example, the higher class is the higher factors of safety are needed) and when it is raised the owner should bear the expenses for structure's reconstruction.

Thus, a new methodology for calculation of possible loss in case of failure of hydraulic structures should be developed, taking into account the process of changing of their class.

At the legislative level it is planned to develop a new algorithm for class changing process, taking into account technical, social and administrative aspects.

Special attention is paid to revision of country's legislature, aimed to reduce risks for population and social objects caused by coastal development of reservoirs and tailwater.

Implementation of above-mentioned implies alteration of the following documents:

- Federal Law "On the safety of hydraulic structures", Governmental Act "On state supervision in the sphere of the safety of hydraulic structures", Governmental Act "On constant state supervision of dangerous industrial objects and hydraulic structures" including prohibition of construction within coastal areas of reservoirs and tailwater;
- Building codes, national standards and other design requirements;
- The code of Administrative Offences including establishment of responsibility for violation of legislature concerning safety of hydraulic structures;
- Regulatory and legislative Acts concerning insurance matters and zero responsibility for third parties' loss in case their property was illegally constructed close to the territory of hydraulic structures. This loss should not be taken into account when estimating the amount of financial guarantees of civil liability and structure's class.

CONCLUSION

Revision of a number of federal laws, technical papers and national standards of Russia, aimed to increase safety and reliability of hydraulic structures is the top issue today. It is a very complex process with lots of participants, including government officials, owners of hydraulic structures, relevant research institutes and design enterprises.

REFERENCES

Federal Law of Russia (1997) "On the safety of hydraulic structures" No. 117-FZ of 23.06.1997.
SP 58.13330.2012 (2012) "Hydraulic structures. Basic statements". Moscow, 2012.