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PERSONAL OPINION

On dissertation work for awarding PhD degree

Author of the dissertation: dipl. Eng. Gencho Dinev Georgiev, PhD student at the "Ocean technologies" department of the IO-BAS, Varna

Subject of the dissertation: "Floating caisson of type pneumo-structure"

Author of the opinion: prof. eng. Lyubomir Ivanov Dimitrov, IO-BAS, Varna

1. Relevance of the developed problem

The dissertation develops an innovative caisson, a type of floating pneumatic structure, applicable in hydraulic engineering for the construction of gravitational facilities subjected to high loads in the aquatic environment, on virtually any type of soil in shallow and deep water. The proposed construction facilitates the selection of sites and starts eliminating the need for their alignment for laying caissons and reduces the cost of materials and time for transport to the site, which significantly reduces the total cost of construction.

In this sense, the proposed solutions are relevant globally.

2. Does the doctoral student know the state of the problem and evaluate the creatively used literary sources

The presented dissertation has a volume of 118 pages with 60 figures and three tables. It consists of an introduction, four chapters, conclusions and recommendations with author's claims and one appendix ("Caisson Program", written in the programming language "Turbo Pascal 1"). Bibliographic reference includes 67 titles, of which 12 in Latin.

The student has a Master's degree in Hydrotechnical Construction of Waterways and Ports. He has worked as a research associate at the Executive Agency - Varna, currently Ch. inspector in the Port Administration Executive Agency.

The literature review provides an in-depth analysis of world practices in the construction of hydraulic structures, comparing the advantages and disadvantages of several types of construction. Based on this analysis, the need to use a new type of large-scale hydraulic structures is derived and the relevance of the topic is substantiated.

Chapter two substantiates the main goal of the dissertation and the tasks that must be solved to achieve it.

Chapter three provides a detailed description of the construction of the new type of caisson, the variety of geometric shapes and structural elements depending on their purpose and the options for construction. The methodology for determining the main elements of the caisson has also been developed here.

Chapter four presents the results of theoretical studies of the buoyancy and stability of the caisson. For the proposed option, the draft, displacement and buoyancy in calm waters and waves are determined and its stability at large roll angles is dimensioned. The same chapter also presents the results of a deliberately planned and conducted model hydrodynamic experiment in which seaworthiness and towing tests of a made model of a caisson structure were made.

In the last sections of the dissertation conclusions and recommendations are made, supporting the practical use of the floating caisson type pneumatic construction.

The PhD student, eng. Georgiev shows in-depth theoretical knowledge and good practical skills, which allow him to properly analyze and summarize the collected theoretical and empirical data. The professional development and experience of the candidate helps in solving the tasks studied in the dissertation.

The dissertation work of Eng. Georgiev has the character of a completed scientific research, of a topical and significant for the theory and practice problem.

3. Do the proposed methodologies give an answer to the set goals and tasks of the dissertation work

In the dissertation the methodology for determining the main elements of a caisson type of pneumatic construction is independently developed, as theoretical researches of the buoyancy and stability of the caisson are made. The deliberately planned and conducted model hydrodynamic experiment shows the good knowledge and practical skills of the PhD student.

4. Contributions of the dissertation

I fully accept the PhD student's claims for royalties as follows:

Scientific - applied contributions:

- 1. A caisson of a new type is proposed a floating pneumatic construction, which is a novelty in the hydraulic engineering construction and without analogue in the world practice. The construction is applicable in hydraulic engineering for the construction of gravitational facilities subjected to high loads in the aquatic environment on any type of land in shallow and deep water areas.
- 2. The working parameters of the project are validated by a specially planned for the purpose experiment of a floating caisson type pneumatic construction in order to establish the basic hydrodynamic properties (stability, resistance, seaworthiness, etc.) of a floating caisson with a dynamic principle of maintenance required during transportation. from the place of production to the place of installation to a specific hydraulic facility.

Practical contributions:

1. A method for mounting a caisson pneumatic structure with the help of back pressure / vacuum / has been developed, as the method for preliminary incision of a bottomless caisson and tension of the ground base is a novelty in the theory and practice of hydraulic engineering.

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- 2. Recommendations for ensuring the structural characteristics of a pneumatic construction caisson at a certain configuration of its parameters in terms of static stability and the required power applied during its towing.
- 3. Recommendations for ensuring the structural characteristics of the pneumatic caisson structure have been made and requirements have been set for the insulation and airtightness of the reinforced concrete, in accordance with the variable external temperature and the impact of the aggressive sea water.

5. Application of the results of the dissertation work in practice

In the submitted documents are attached two copyright certificates for inventions on the merits of the dissertation: the first, for a new type of caisson - floating pneumatic structure, with copyright certificate N_{0} 44643 / 08.07.1985, with unsupported patents in Bulgaria, the Netherlands, France, Finland, Singapore (China) and Russia; and the second for a method of mounting the facility.

This is enough eloquent evidence of the applicability of the development in practice.

6. Remarks and recommendations

I believe that despite the significant delay in the presentation of this work, as evidenced by the dates of copyright certificates for inventions, it is still relevant today, as research and results are a broad basis for future research and possible implementation in practice..

7. Abstract

The developed abstract has a volume of 35 pages in Bulgarian and 32 pages in English. It essentially well reflects the content of the dissertation and meets the requirements of the Law and the requirements of the Regulations of IO-BAS. In terms of content, the contributions indicated in the abstract objectively reflect the achievements of the doctoral student.

CONCLUSION

After my review and analysis of the dissertation, "Floating caisson type pneumoconstruction" and the submitted documents, I can say that they fully meet the requirements of ZRASRB, the Regulations for its application and the requirements PPZRASRB of IO-BAS for the acquisition of ONS "Doctor". The work is entirely personal work of the doctoral student, protected by two certificates of inventions and shows in-depth knowledge and ability for independent scientific work.

The above gives me the conviction to offer the esteemed members of the scientific jury to award Eng. Gencho Dinev Georgiev the educational and scientific degree "DOCTOR" in the doctoral program "Oceanology" in a professional field "Earth Sciences".

July 07, 2020

Prepared by: ((prof. eng. Lyu

Varna