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FATIGUE STRENGTH OF A STRUCTURAL ELEMENT EXPOSED TO ICE LOADING

The cyclic nature of effects of ice loading contributes to the formation of non-reversible deformations and defects of structural elements that may cause loss of the bearing capacity of the structure due to the accumulation of fatigue damages in dangerous sections. The damages in question are caused by moderate loads of multiple repeatability. In order to assess the number of cycles of ice loading that the structure may be exposed to without any substantial damages, the authors have developed a simulation model of ice load formation that serves as the basis for the analysis of the loading pattern that the structure is exposed to. This loading pattern is the initial one for the purposes of calculation of the fatigue resistance of structural elements to ice load effects. In the research, the authors provide for the joint application of the simulation model of ice load formation and the model of accumulation of fatigue damages to assess the ice resistance of a platform and its reliability from the viewpoint of its failure.

Key words: offshore, ice resistant structure, ice, force, loading cycle, fatigue, strength.

References

1. Daley C.G. Ice Edge Contact — an Iterative Failure Process Model. Report no. M-103 by the Laboratory of Naval Architecture and Marine Engineering, Helsinki University of Technology, Espoo, 1990, 65 p.

2. Kärnä T. Finite Ice Failure Depth in Penetration of a Vertical Indentor into an Ice Edge. Annals of Glaciology, 1993, vol. 19, pp. 114—120.

3. Timco G.W. Indentation and Penetration of Edge-Loaded Freshwater Ice Sheets in the Brittle Rang. Proceedings of the 5th Conference on Offshore Mechanics and Arctic Engineering. Tokyo, 1986, pp. 444—452.

4. Sodhi D. Ice Structure Interaction with Segmented Indentors. Proceedings of IAHR Ice Symp., Banff, Canada, 1992, pp. 909—929.

5. Uvarova T.E. *Metodika opredeleniya kolichestva tsiklov i rezhima nagruzheniya sooruzheniya dreyfuyushchim ledyanym pokrovom* [Methodology of Identification of the Number of Cycles and the Drifting Ice Cover Loading Mode That the Structure Is Exposed to]. Vladivostok, 1999, 22 p.

6. Kogaev V.P. *Raschet na prochnost' pri napryazheniyakh peremennykh vo vremeni (Biblioteka raschetchika)* [Analysis of Strength in the Event of Time-variable Stresses (Library of a Computing Engineer)]. Moscow, Mashinostroenie Publ., 1977, 232 p.

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