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EINLADUNG

zum Gastvortrag

von

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am

Mittwoch, 15.06.2016, 13:30 Uhr (s.t.)

Technische Universität Wien, Karlsplatz 13, 1040 Wien
Seminarraum 202 (Stiege 2, 2. Stock + Halbstock)

FROST DESTRUCTION AND FRACTURE MECHANICS OF CONCRETE (Part 1)

Abstract: The given lecture is devoted to a quantitative evaluation of the contribution of various mechanisms destruction (common crystallizative pressure of ice, hydrostatic pressure of water, pressure additional creation of crystalls of ice, hydraulic pressure etc.) in general process of destruction under cyclic freezing – thawing (CFTh), using fracture mechanics methods.

A theoretical model predicting the freezing behavior of porous materials such as concrete is presented. The model is derived from thermodynamic equilibrium condition and fracture mechanics considerations. Fundamental equations were drived on the microscopic level and then the resulted local deformation around pores was averaged to evaluate the nominal strain on a macroscopic level. In the model on the microscopic level, temperature-induced phase transitions and the resulting mass-transfer within the pore structure of the materials were taken into consideration.

Components of the macroscopic deformation in the presented model are the expansion due to the internal pressure caused by phase transition and the shrinkage due the mass-transfer caused by the ice-lense mechanism.

PROBABILISTIC MODELS FOR CALCULATING THE DEPTH AND DISTRIBUTION OF CHLORIDES IN CONCRETE HYDRAULIC STRUCTURE O. SAKHALIN (Part 2)

Abstract: The concrete corrosion, which is due to their positive properties of one of the most popular, by far, the materials in the field of hydraulic engineering. Concrete under exploitation conditions, are particularly susceptible to aggressive action of the environment, which consists in neutralization of the surface layer of the concrete and the formation of the compounds that affect its properties. The most common aggressive operating environment for many designs of marine engineering structures is aggressive chloride-containing environments.

For the conditions of the Sakhalin main source of chloride contamination designs are sea water. Impact chlorides contained therein leads to degradation of the material supporting structure, a significant change in its mechanical characteristics, resulting in significantly reduces bearing capacity and durability of structures.

The problem of predicting the behavior of reinforced concrete structures in aggressive chloride environments are still relevant. According to field surveys, project analysis and examinations established, which is exposed to corrosive media up to 75% of engineering structures and buildings. The most intensive corrosion processes take place in the area of running water horizons, slowly - in the underwater area. Most marine concrete hydraulic structures on. Sakhalin operated without reconstruction for over 30 years. Many of them are in critical condition because of corrosion by seawater in the variable level area.

On the basis of analysis of the reinforced concrete hydraulic structures it is concluded that the main reason for failure is the corrosion of reinforcement. In most cases it initiated reinforcement corrosion penetration chlorides. Chloride salts dissolved in sea water penetrates through the pores of the concrete, react chemically with the armature, causing it to corrode. Rust leads to a sharp decrease in strength of adhesion with the concrete reinforcement and is thus an intensive process of cracking. In this case, the amount of reinforcement increases sharply, there is spalling of concrete cover, which further speeds up the process of destruction of concrete.

The development of methods of forecasting durability designed and operated assessment of reinforced concrete structures caused by: a) increasing the use of reinforced concrete structures in severe climatic conditions or in aggressive environments; b) the high cost of strengthening, recovery and maintenance costs required to maintain the technical condition of constructions and structures; c) the practice of new kinds of concrete and reinforcement borders which durability in real time do not receive a sufficiently precise experimental confirmation. The key in longevity is the question of predicting the lifetime of the new reinforced concrete structures, which is regarded as a more secure option than durability. In some methods, but in general, the problem of predicting the life still in the stage of development currently on the deterministic and probabilistic levels developed. No single system approach and standard model to assess the durability and life prediction. On a practical level, durability and service life of reinforced concrete structures are controlled by limiting the maximum permissible water-cement ratio, concrete grade, reinforcement and thickness of the protective layer.