

Summary

The dissertation relates to an attempt to comprehensively present issues related to PCC-type mortars, used for repair and reprofiling of concrete structures, in the context of durability and effectiveness of the repair. The use of mortars for the repair of concrete structures characterized by a lack of or limited resistance to environmental influences, especially those caused by cyclic freezing and thawing, are often the main reason for the failure of the repair performed.

The subject of the dissertation is to determine the methodology and types of necessary tests of PCC-type repair mortars, ensuring adequate performance from the point of view of durability and effectiveness of repairs to bridge structures. Performance properties regarding the essential characteristics of the mortar in terms of permanent adhesion to the substrate and permanent flexural and compressive strength, evaluated after a frost resistance test in a climatic chamber, were identified as key factors in well repair mortars.

The dissertation presents a comparison of the methodology and analysis of the obtained results of own frost resistance tests in terms of changes in the mechanical properties of repair mortars according to the method commonly used in the Polish market - without the participation of de-icing salts and the method described according to PN-EN 1504-3 - with the participation of de-icing salts. The subjects of the study were repair mortars of the PCC type of R4 class subjected to frost resistance tests in terms of weight loss, changes in flexural and compressive strength and adhesion to concrete substrate. For the purpose of carrying out our own research, a new test method was implemented to evaluate changes in the mechanical properties of repair mortars after cycles of freezing in a saturated NaCl solution and thawing with water. The analysis of the obtained results of frost resistance tests according to national guidelines and the European standard made it possible to indicate the scope of aging tests allowing to evaluate the mortar in relation to the effectiveness and durability of the repair performed.

For cognitive purposes, the research approach to the issues related to frost destruction processes taking place at two levels: internal (internal destruction) and external (surface scaling) was presented. The dissertation also presents basic principles for the design and execution of repairs to concrete structures using mortars, including the economic aspect.

Keywords: repair mortar, concrete, concrete structure, bridge structure, aging tests, frost resistance