

ABSTRACT OF DOCTORAL THESIS:

„Study of the effectiveness of corrosion protection of a hot-dip galvanized coating on reinforcing steel in concrete”

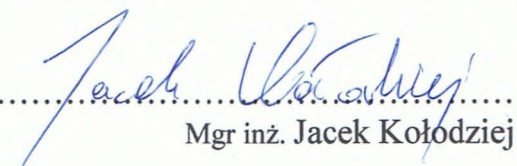
The doctoral dissertation concerns the issues of anticorrosive coating protection of reinforcement in concrete with the use of a hot dip galvanized coating. The aim of the work was to experimentally evaluate the protective properties of a zinc coating on reinforcing steel in a synthetic pore solution and in concrete test specimens. In addition, the bond strength of hot dip galvanized rebar to concrete was analysed experimentally. The tests were carried out on ribbed steel of the B500SP grade, popular in reinforced concrete structures.

The doctoral dissertation has been divided into two main parts. The first part is an overview of the existing knowledge on the basic information on the corrosion of reinforcement, methods of protections the reinforcement in concrete, the influence of corrosive factors on the reinforcement and the adhesion of galvanized steel to concrete. The second part of the dissertation contains the results of own research, of the obtained coating thickness, electrochemical tests of steel in synthetic pore solutions and in concrete specimens, as well as microstructural tests of the contact zone of reinforcing steel, galvanized coating and concrete. Also described are tests of force pulling out the rebar from concrete, supported with the optical measurements, and tests of the anchorage stiffness of galvanized rebar in concrete.

The conducted polarization electrochemical tests in the synthetic pore solution confirmed the possibility of revealing a high risk of corrosion in the case of galvanized steel at a high pH level, as opposed to black steel. The tests on reinforced concrete specimens with chlorides also revealed a high risk of corrosion of hot dip galvanized rebar. However, microstructural observations after two years of exposure to chloride contaminated concrete confirmed that the galvanized coating still protect the anti-corrosive steel rebar.

In the last part of the work, due to the ambiguous literature reports, tests were also carried out on the bond strength of rebar to concrete.

The test results showed that the presence of a zinc coating on the rebar essentially reduces the maximum bond stresses and reduces the anchorage stiffness compared to non-galvanized rebar. Moreover, it was found that the anchorage stiffness of hot dip galvanized rebar in the concrete with chlorides was higher than in the case of concrete without the addition of chlorides.

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