

Summary of Doctoral Thesis

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Title: *CONCRETE RESISTANCE TO ENVIRONMENTAL IMPACT
IN MASSIVE CONSTRUCTIONS, ON THE EXAMPLE OF CONSTRUCTION BLOCK
No. 5 AND 6 OPOLE POWER PLANT*

The doctoral dissertation takes up the issue of massive concrete resistance to environmental impact. Special emphasis has been placed on the whole process of realization of a massive object including the design of concrete, taking into account the hydration heat reduction of cement (binder), and the process of placing and curing for massive concrete element. The main objective of the thesis is to determine the possibilities and the rules of designing the composition of massive concrete, considering the durability in an environmental exposure classes.

Realization of thesis objective has been motivated by the lack of national standards recommendations and guidelines for massive concrete. In the literature review massive concrete specifics with the rules of choice of concrete mix components and technological determinations constructions performing were presented, and also potential corrosion impact of environment was characterized.

The scope of test including: physical and chemical characteristics of massive concrete components, fresh concrete mix tests and hardened concrete test in a range of heat of hydration, compressive strength and durability (corrosion induced by carbonation, chlorides, freeze / thaw attack, sulfate attack and alkali – silica reaction). Results have been confirmed by the realizations of the engines rooms foundations no.: 5 and 6 Opole Power Plant with a volume of 11 000 m³ each and boilers foundations no.: 5 and 6 Opole Power Plant with a volume of 18 500 m³ each.

Realized tests of concrete in laboratory, production scale and monitoring of the structure state, at every stage of execution, confirmed the assumptions and the thesis of the dissertation. In the dissertation attention was paid to the importance, for concrete massive construction, proper thermal-humidity cure based on monitoring the temperature distribution of the hardening concrete in the structure.

Based on own research results and experience in realization of massive foundations, it was proposed to use to evaluate the massive concrete properties equivalent concrete performance concept (ECPC) or equivalent performance of combinations concept (EPCC), including type of cement and quantity and type II additive (in national conditions, it is usually fly ash conforming the standard PN-EN 450-1 requirements).