Studies on Damage of the Reinforced Concrete Structures Deteriorated by Alkali-Silica Reaction and Evaluation Method for Alkali-Silica Reactivity of Aggregates

Hironobu SUZUKI

This paper is composed of three following studies.

①Study on evaluation methods for alkali-silica reaction of aggregate and concrete.

②Study on effects of the expansion due to the alkali-silica reaction on the reinforced concrete structures.

③Study on the durability of reinforced concrete structures throughout the long term.

Six kinds of coarse aggregates were used in order to evaluate the reactivity of alkali-silica reaction of aggregates by using JIS A 1145,1146 and ASTM C 1260 methods. The evaluation obtained by the chemical or mortar bar of methods specified in JIS did not agree with that by the accelerated mortar bar method specified in ASTM. It was became clear that the expansion of mortar and concrete was dependent on the type of the aggregate, mixture proportion, specimen size, added alkali, the alkali which infiltrated from the outside of the test-piece affected

In addition ,the method to calculate the expansion due to the ASR was proposed by using the relation between the expansion of concrete and the decrease of modulus of elasticity of concrete.

The influence of the expansion due to ASR on RC structures were evaluated by exposure tests, loading test of specimens and FEM analysis.

By the expansion due to ASR, large strain generated in the inside of the bending division of the reinforcement. This causes the breaking of the reinforcement.

14 years', exposure tests of the reinforced concrete was carried out. And, the accelerated corrosion tests of reinforced concrete specimens in which the crack was generated was carried out. From these results, the durability of the reinforced concrete was examined. Independent of the type of the cement, the durability is high, if it is under W/C=45%.

The maintenance technique was proposed based on these results.