

4. Investigation of the Crack Prevention Effects of Expansive Additive in Massive Concrete Structures (Part 3) - Examination of Expansive Strain and Restraining Effects of Reinforcements -

Kunikazu Azuma, Toshiharu Nakamura, Hitoshi Masui

The effects of expansive additives added to massive concrete were investigated by testing concrete specimens that imitated walls and consisted of concrete layers placed on the top of another. Concrete specimens that contained no reinforcement and reinforced concrete specimens that had different amounts of reinforcements arranged in a three-dimensional manner were prepared, and the strains of the concrete and reinforcements were measured. In all specimens, the strain at the boundary of the expansive and ordinary concrete layers changed gradually due to the mutual effects of the layers. The peak strains along the latitudinal main reinforcements in the expansive concrete parts of the reinforced concrete specimens were controlled to 74% of that of the non-reinforced concrete specimen due to the restraining effects of the reinforcements. The reductions in expansive strain by the restraining was analyzed using a method that involved giving expansive strain to a three-dimensional finite element model so as to decrease depending on element stress, which showed an expansive strain along the latitudinal reinforcement of 79%. The analytical method was shown to be effective for predicting the effects of expansive additives in reducing the shrinkage in concrete structures.

Key words : massive concrete, thermal stress, expansive additive, expansive strain, reinforced concrete