

Long-Term Durability of Roller-Compacted Concrete Pavement

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Abstract : Roller-compacted concrete pavement (RCCP), an environmental friendly pavement of which load carry capacity benefitted from both hydration and aggregate interlock from roller compacting, demonstrated a superb structural performance for a relatively small amount of water and cement content. Even though an excellent structural performance can be secured, it is required to investigate roller-compacted concrete (RCC) under environmental loading and its long-term durability under critical conditions. In order to secure long-term durability, an appropriate internal air-void structure is required for this concrete. In this study, a method for improving the long-term durability of RCCP is suggested by analyzing the internal air-void structure and corresponding durability of RCC. The method of improving the long-term durability involves measurements of air content, air voids, and air-spacing factors in RCC that experiences changes in terms of type of air-entraining agent and its usage amount. This test is conducted according to the testing criteria in ASTM C 457, 672, and KS F 2456. It was found that the freezing-thawing and scaling resistances of RCC without any chemical admixture was quite low. Interestingly, an improvement of freezing-thawing and scaling resistances was observed for RCC with appropriate the air entraining (AE) agent content; Relative dynamic elastic modulus was found to be more than 80% for those mixtures. In RCC with AE agent mixtures, large amount of air was distributed within a range of 2% to 3%, and an air void spacing factor ranging between 200 and 300 μm (close to 250 μm , recommended by PCA) was secured. The long-term durability of RCC has a direct relationship with air-void spacing factor, and thus it can only be secured by ensuring the air void spacing factor through the inclusion of the AE in the mixture.

Keywords : durability, RCCP, air spacing factor, surface scaling resistance test, freezing and thawing resistance test

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