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Freeze-thaw durability of non-air-entrained roller compacted concrete designed for pavement containing cement kiln dust

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ABSTRACT

Cement kiln dust (CKD) which is a byproduct of cement production plants has been widely used in various construction projects. Since the pavement layers are in direct contact with the environment, their durability characteristics are considered as an important issue. This study was performed to evaluate the durability characteristics of roller compacted concrete designed for pavement (RCCP) containing different quantities of CKD as cement replacement and its relationship to the physical and mechanical properties of RCCP. The main experimental program included compressive strength, indirect tensile strength, flexural strength after 7, 28 and 90 days of curing, water absorption, permeable void content and mercury intrusion porosimetry on 28-day specimens. The freeze-thaw durability of beam-shaped specimens was characterized by ASTM C666, procedure A. The dynamic modulus of elasticity before and after freeze-thaw exposure was measured by ultrasonic pulse velocity test and the durability factor was calculated. Based on the obtained results cement replacement by 2% CKD resulted in the best mechanical and durability properties. However, further increase of CKD was not useful in improving neither mechanical nor durability properties.

Keywords: Cement kiln dust, Roller compacted concrete, Freeze-thaw durability, Ultrasonic pulse velocity, Durability factor

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