

Assessing the Effect of Freezing and Thawing of Coverzone of Ground Granulated Blast-Furnace Slag Concrete

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Abstract : Freezing and thawing are considered to be one of the major causes of concrete deterioration in the cold regions. This study aimed at assessing the freezing and thawing of concrete within the cover zone by monitoring the formation of ice and melting at different temperatures using electrical measurement technique. A multi-electrode array system was used to obtain the resistivity of ice formation and melting at discrete depths within the cover zone of the concrete. A total number of four concrete specimens (250 mm x 250 mm x 150 mm) made of ordinary Portland cement concrete and ordinary Portland cement replaced by 65% ground granulated blast furnace slag (GGBS) is investigated. Water/binder ratios of 0.35 and 0.65 were produced and ponded with water to ensure full saturation and then subjected to freezing and thawing process in a refrigerator within a temperature range of $-30 ⁰C$ and $20 ⁰C$ over a period of time 24 hours. The data were collected and analysed. The obtained results show that the addition of GGBS changed the pore structure of the concrete which resulted in the decrease in conductance. It was recommended among others that, the surface of the concrete structure should be protected as this will help to prevent the instantaneous propagation of ice through the rebar and to avoid corrosion and subsequent damage.

Keywords : concrete, conductance, deterioration, freezing and thawing

Conference Title : ICBE 2016 : International Conference on Built Environment

Conference Location : London, United Kingdom

Conference Dates : July 28-29, 2016