

Effect of Silica Fume at Cellular Sprayed Concrete

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Abstract : Silica fume which is a super-fine byproduct of ferrosilicon or silicon metal has a filling effect on micro-air voids or a transition zone in a hardened cement paste by appropriate mixing, placement, and curing. It, also, has a Pozzolan reaction which enhances the interior density of the hydrated cement paste through a formation of calcium silicate hydroxide. When substituting cement with silica fume, it improves water tightness and durability by filling effect and Pozzolan reaction. However, it needs high range water reducer or super-plasticizer to distribute silica fume into a concrete because of its fineness and high specific surface area. In order to distribute into concrete evenly, cement manufacturers make a pre-blended cement of silica fume and provide to a market. However, a special mixing procedures and another transportation charge another cost and this result in a high price of pre-blended cement of silica fume. The purpose of this dissertation was to investigate the dispersion of silica fume by air slurry and its effect on the mechanical properties of at ready-mixed concrete. The results are as follows: A dispersion effect of silica fume was measured from an analysis of standard deviation for compressive strength test results. It showed that the standard deviation decreased as the air bubble content increased, which means that the dispersion became better as the air bubble content increased. The test result of rapid chloride permeability test showed that permeability resistance increased as the percentages of silica fume increased, but the permeability resistance decreased as the quantity of mixing air bubble increased. The image analysis showed that a spacing factor decreased and a specific surface area increased as the quantity of mixing air bubble increased.

Keywords : cellular sprayed concrete, silica fume, deviation, permeability

Conference Title : ICCESE 2018 : International Conference on Civil, Environmental and Structural Engineering

Conference Location : Prague, Czechia

Conference Dates : August 13-14, 2018