

## Effect of Electric Arc Furnace Coarse Slag Aggregate And Ground Granulated Blast Furnace Slag on Mechanical and Durability Properties of Roller Compacted Concrete Pavement

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**Abstract :** Industrial by product utilization has been encouraged due to environment and economic factors. Since electric arc furnace slag aggregate is a by-product of steel industry and its storage is a major concern hence it can be used as a replacement of natural aggregate as its physical and mechanical property are comparable or better than the natural aggregates. The present study investigates the effect of partial and full replacement of natural coarse aggregate with coarse EAF slag aggregate and partial replacement of cement with ground granulated blast furnace slag (GGBFS) on the mechanical and durability properties of roller compacted concrete pavement (RCCP). The replacement level of EAF slag aggregate were at five levels (i.e. 0% ,25% ,50%,75% & 100%) and of GGBFS was (0 % & 30%). The EAF slag aggregate was stabilized by exposing to outdoor condition for several years and the volumetric expansion test using steam exposure device was done to check volume stability. Soil compaction method was used for mix proportioning of RCCP. The fresh properties of RCCP investigated were fresh density and modified vebe test was done to measure the consistency of concrete. For investigating the mechanical properties various tests were done at 7 and 28 days (i.e. Compressive strength, split tensile strength, flexure strength modulus of elasticity) and also non-destructive testing was done at 28 days (i.e. Ultra pulse velocity test (UPV) & rebound hammer test). The durability test done at 28 days were water absorption, skid resistance & abrasion resistance. The results showed that with the increase in slag aggregate percentage there was an increase in the fresh density of concrete and also slight increase in the vebe time but with the 30 % GGBFS replacement the vebe time decreased and the fresh density was comparable to 0% GGBFS mix. The compressive strength, split tensile strength, flexure strength & modulus of elasticity increased with the increase in slag aggregate percentage in concrete when compared to control mix. But with the 30 % GGBFS replacement there was slight decrease in mechanical properties when compared to 100 % cement concrete. In UPV test and rebound hammer test all the mixes showed excellent quality of concrete. With the increase in slag aggregate percentage in concrete there was an increase in water absorption, skid resistance and abrasion resistance but with the 30 % GGBFS percentage the skid resistance, water absorption and abrasion resistance decreased when compared to 100 % cement concrete. From the study it was found that the mix containing 30 % GGBFS with different percentages of EAF slag aggregate were having comparable results for all the mechanical and durability property when compared to 100 % cement mixes. Hence 30 % GGBFS can be used as cement replacement with 100 % EAF slag aggregate as natural coarse aggregate replacement.

**Keywords :** durability properties, electric arc furnace slag aggregate, GGBFS, mechanical properties, roller compacted concrete pavement, soil compaction method

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