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Utilization of Sewage Sludge Ash in Self-Compacted Concrete

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Abstract **-** Rapid urbanization throughout the world resulted in a considerable amount of sewage sludge, which is commonly considered a great environmental concern. Also, the rapid growth of self-compacting concrete (SCC) marks a significant milestone in enhancing the construction industry's effectiveness. Hence, an experimental program was carried out to study self-compacting concrete (SCC) properties incorporating sewage sludge ash (SSA) as a partial replacement of cement. Mixes were prepared with two percentages (0 and 20% by mass) of SSA as partial replacement of cement. The slump flow, T_{50} flow time, J-ring, and V-funnel were evaluated for the fresh SCC. Hardened properties of SCC were assessed by measuring compressive strength, rapid chloride penetration, bulk electrical resistivity, water absorption rate (i.e., sorptivity), and water permeability. Test results indicated that SCC made with SSA must incorporate a higher dosage of admixtures than the control mix to achieve satisfactory workability, passing ability, and viscosity. SSA contributed to the concrete mix's late strength development and led to durable concrete with a low chloride permeability resistance and a high electrical resistivity. There was a negligible increase in the rate of water absorption and water permeability. However, the water absorption rate and permeability are expected to reduce with age due to the pozzolanic reaction of SSA. SSA was found to have the potential to be used as partial cement replacement in making SCC, which could lead to a profound impact on solid waste management and sustainable development in the construction industry.

Keywords**:** Self-Compacted Concrete, Sewage Sludge Ash, Sustainability, Fresh Stage, Hardened Stage, Durability