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Experimental study on partial replacement of fine aggregate by surkhi

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Abstract: Recently, industrial waste has grown drastically, causing several countries to investigate its usage. Recycling industrial waste in concrete is an efficient way to achieve sustainability while decreasing the environmental impact. This strategy not only improves the characteristics of concrete but also reduces building expenses. The current study focuses on using powdered burnt clay (surkhi), air-cooled blast-furnace slag (ACBFS), and ground granulated blast-furnace slag (GGBFS) as partial replacements for fine and coarse aggregates, as well as ordinary Portland cement. The research examines M40 grade concrete with a water-to-cement ratio of 0.36, utilizing three different percentages of cement and coarse aggregate replacements with GGBFS and ACBFS: 20%, 30%, and 40%. Additionally, fine aggregate is replaced with surkhi in three percentages: 10%, 20%, and 30%. Compressive and splitting tensile strength tests are conducted on different curing days for all mixes. The strength of the cube specimens ranges from 51.87 N/mm² to 69.71 N/mm². The optimum compressive strength of the concrete mix is observed to be 69.71 N/mm², achieved with 20% GGBFS and 10% silica fume, and the sample containing 20% ACBFS and 10% silica fume has the maximum splitting tensile strength.

Keyword:
Sustainability, air–cooled blast–furnace slag (ACBFS), Ground granulate blast-furnace slag (GGBFS), surkhi, Compressive strength, Industrial waste materials.