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A Study of Mortars with Granulated Blast Furnace Slag as Fine Aggregate and Its Influence on Properties of Burnt Clay Brick Masonry

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Abstract : Natural river sand is the most preferred choice as fine aggregate in masonry mortars. Uncontrolled mining of sand from riverbeds for several decades has had detrimental effects on the environment. Several countries across the world have put strict restrictions on sand mining from riverbeds. However, in countries like India, the huge infrastructural boom has made the local construction industry to look for alternative materials to sand. This study aims at understanding the suitability of granulated blast furnace slag (GBS) as fine aggregates in masonry mortars. Apart from characterising the material properties of GBS, such as particle size distribution, pH, chemical composition, etc., of GBS, tests were performed on the mortars with GBS as fine aggregate. Additionally, the properties of five brick tall, stack bonded masonry prisms with various types of GBS mortars were studied. The mortars with mix proportions 1: 0: 6 (cement: lime: fine aggregate), 1: 1: 6, and 1: 0: 3 were considered for the study. Fresh and hardened properties of mortar, such as flow and compressive strength, were studied. To understand the behaviour of GBS mortars on masonry, tests such as compressive strength and flexure bond strength were performed on masonry prisms made with a different type of GBS mortars. Furthermore, the elastic properties of masonry with GBS mortars were also studied under compression. For comparison purposes, the properties of corresponding control mortars with natural sand as fine aggregate and masonry prisms with sand mortars were also studied under similar testing conditions. From the study, it was observed the addition of GBS negatively influenced the flow of mortars and positively influenced the compressive strength. The GBS mortars showed 20 to 25 % higher compressive strength at 28 days of age, compared to corresponding control mortars. Furthermore, masonry made with GBS mortars showed nearly 10 % higher compressive strengths compared to control specimens. But, the impact of GBS on the flexural strength of masonry was marginal.

Keywords : building materials, fine aggregate, granulated blast furnace slag in mortars, masonry properties
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