

ABSTRACT

Concrete is one of the significant substances used in the construction of infrastructures. Fine aggregate is an unavoidable material that plays a major role in the concrete mix design. This fine aggregate is obtained from natural resources and its continuous demand is creating scarcity and ecological issues day by day. Through the partial substitution of various alternative materials for natural fine aggregate (NFA), this study intends to assess the mechanical characteristics of concrete which plays an important role in evaluating the durability and structural integrity of building materials. Finding workable solutions to preserve or enhance the mechanical performance of the concrete, cut costs, and reduce the environmental impact of production are the key objectives. A number of alternate options to natural sand in concrete are available such as – stone dust, brick dust, broken glass, plastic powder, steel slag, recycled concrete aggregate (RCA), marble dust, etc. In our research, we used brick dust as an alternative to natural sand in concrete. Sylhet sand was used as fine aggregate in concrete and brick dust was collected from a construction project site. Various percentages (%) of brick dust were used to replace sand in concrete and they are 10%, 20%, 30%, 40%, and 50%. Cylindrical concrete specimens were cast and cured under controlled conditions to ensure consistency, and a series of tests were undertaken according to appropriate standards to assess their mechanical performance. The samples were prepared accordingly and the compressive and split tensile tests were conducted in the laboratory. From the lab investigation, it was observed the highest compressive strength and split tensile strength were obtained for 10% sand replacement with brick dust. For 100% NFA, the compressive strength and tensile strength were 19.5 MPa and 2.35 MPa respectively at 28 days of curing and the corresponding values for 10% brick dust were 31.83 MPa and 3.81 MPa respectively. The compressive strength was increased 63% compared to the reference sample and the increase in split tensile strength was 62%. The result of compressive strength test and split tensile strength test were also observed at 7 days and an increase in strength was observed. For other percentages of brick dust the corresponding strengths were also increased though a decreasing pattern was observed as the percentage of brick dust increased.