

Evaluation of Kunhar River aggregate as a construction material, District Mansehra Khyber Pakhtunkhwa, Pakistan

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Abstract

Physically, chemically and economically sound aggregate is required for in progress and planned project. In Kunhar River there are huge water channel deposits of pebble to boulder sizes which can be used as economical aggregate in Khyber Pakhtunkhwa and Punjab. Comprehensive study was carried out on the aggregates of Kunhar River, Garhi Habibullah, District Mansehra. The research work is based on physical, chemical, mechanical and petrographic characteristics of aggregates of pebbles to cobbles size of the study area. The objective of the research is to evaluate aggregate properties of these economical deposits which have no cost of mining or blasting.

Quantitative study of the project area reveals that the rock types of the aggregate encountered in the field study are 40.44% sedimentary rocks including limestone, sandstones and dolomitic chert, 25.55% metamorphic rocks including schists, gneisses, marbles, slates and epidosite and 34.01% igneous rocks including peridotite, dolerite, gabbro, granites albitite.

Alkali Silica Reaction (ASR) has been performed according to ASTM C1260. Its interpretation depicts that the aggregate of Kunhar River lies in innocuous aggregate and the rate of ASR is slow.

The mechanical tests i.e., Los Angeles Abrasion Value (LAAB), Aggregate Crushing Value (ACV), Aggregate Impact Value (AIV), sulphate soundness, specific gravity, clay lumps and friable particles tests have been accomplished. Result exhibits that the LAAB (26.4%) is fair, AIV (16%) is good, ACV (24.92%) is fair. Sulphate soundness test (1.8%), clay lumps and friable particles tests (0.19%) and specific gravity (0.45%) percentage show that it can be used for construction purpose.

A comprehensive petrographic study of 26 representative samples has been carried out to evaluate the mineral composition. As far as the ASR potential of the Kunhar River aggregate is concerned, potentially reactive constituents found during the petrographic examination, are chert and strained quartz. All of the igneous rocks contain less than 20% strained quartz while metamorphic and sedimentary rocks contain quartzite, schists, gneisses and dolomitic chert with more than 20% deleterious minerals and renders this aggregate reactive with an ASR potential.

Since the engineering properties are within limits, therefore, the aggregate can be used as a road aggregate but not as a cement concrete aggregate. It can be used as a cement concrete aggregate by adding slag, pozzolana, fly ash, lithium salts or by using low alkali cement.