

Assessment of Strength Characteristics of Concrete Made from Locally Sourced Gravel Aggregate from South-South Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The aim of this research is to verify the suitability of local gravel aggregates obtained from the Southern part of Akwa Ibom State for designed concrete production in place of crushed granite aggregate sourced from distance places at exorbitant cost. This paper assesses the strength characteristics of concrete made from two locally sourced gravel aggregates of 10 mm and 20 mm maximum sizes.

Study Design: Three samples of gravels divided into washed and unwashed gravels were used for the research. Concrete mix design of 25 N/mm² at 28 days of curing was the target mean strength of the research.

Place and Duration of Study: Department of Civil Engineering, Covenant University, Ota –Nigeria, between September 2014 and July 2015.

Methodology: Particle size distribution test, specific gravity test, water absorption test, aggregate crushing value test, flakiness and elongation tests, slump test, compressive strength test were performed on the samples. Concrete cubes 150 mm were cast for each gravel size and three specimen tested for 3, 7, 14, 21 and 28 days compressive strength.

Results: The washed gravels with 10 mm and 20 mm maximum size reached the target mean strength with 29.7 N/mm² and 26.2 N/mm² respectively while the unwashed gravel with 20 mm maximum size yielded a compressive strength of 24.5 N/mm² at 28 days.

Conclusion: The results prove that the size, grading, internal bonding and deleterious material contribute immensely to the strength of concrete made from gravel aggregate.

Keywords: Concrete; gravel aggregate; aggregate size; aggregate properties; compressive strength; deleterious materials.