

EXPERIMENTAL STUDY ON GEOPOLYMER CONCRETE WITH RECYCLED AGGREGATE AT AMBIENT TEMPERATURE

A Major Project Report Submitted to Civil Engineering Department

For

**Partial Fulfilment of the Requirement for Award of Degree of
Batchelor of Technology in Civil Engineering**

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DEPARTMENT OF CIVIL ENGINEERING

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CERTIFICATE

Certified that the Major project report entitled “**Experimental Study on Geo Polymer Concrete With Recycled Aggregate At Ambient Temperature**” submitted by **VIKAS SARASWAT, ABHISHEK TRIPATHI, VAIBHAV KUMAR, , OM PRAKASH, THANNI SAI KRISHNA, ABHINASH KUMAR**, B. Tech VIII Semester, in partial fulfilment of the requirements of the award of degree of Bachelor of Technology in Civil Engineering, School of Studies in Engineering and Technology Guru Ghasidas Vishwavidyalaya Bilaspur is accorded to the student’s own work, carried out by them in the Department of Civil Engineering during session 2022-23 under my supervision and guidance.

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ABSTRACT

Global warming is a threatening issue in the recent times and cement industry also contributes to CO₂ emission. This necessitates for the alternative construction materials to lessen the carbon emission, and to carry out sustainable development. One such is the geopolymer concrete, a concrete formed by organic/inorganic materials using alkaline activation solution which is made of aluminosilicates. Moreover, it also consumes waste material/by-product and significant natural resources to produce geopolymer concrete in order to meet global infrastructure developments. By utilization of recycled aggregate from crushed concrete waste as an alternative to natural aggregates in construction industries solves the construction and demolition waste disposal problem and reduces the gap between the demand and supply. The Use of recycled aggregate results in higher porosity, water absorption and thus weaker interfacial transition zone between the new cement mortar and aggregate which results the reduction in strength and mechanical and durability properties of concrete.

In this present study, an attempt was made to study the strength and durability of fly ash-based geopolymer concrete with different partial replacement of natural coarse aggregate with recycled coarse aggregate and cured at ambient temperature. M25 grade concrete was considered for all concrete mixes and it was designed as per IS 10262-2019 and made by the alkali solution of 15 Molar NaOH and ratio of NaOH and Na₂SiO₃ was taken as 1:1 in this work. A total of thirteen concrete mix proportions were prepared with partial replacement of natural coarse aggregate with 30%, 50% and 100% recycled coarse aggregate. Where 4 mix proportions are made with 85% Fly Ash plus 15% Lime, 4 mix proportions with 85% Fly Ash and 15% GGBS, 4 mix proportions with 85% Fly Ash, 7.5% Lime and 7.5% GGBS and 1 mix as Control Mix with 100% PPC. The concrete properties viz: workability, compressive strength, split tensile, ultrasonic pulse velocity (UPV), water absorption, Density, Sulphate Attack and Sorptivity was studied. From the experimental results, it may be concluded that the desired strength of GPC of Fly-ash + GGBS mix gives better results as compared to the other mixes even by replacing 100% NCA with 100% RCA.

Keywords: NCA – Natural Coarse Aggregate, RCA – Recycled Coarse Aggregate, GPC – Geopolymer concrete UPV – Ultra-Sonic Pulse Velocity