

# FLY ASH BASED CONCRETE: EXPERIMENTAL AND STATISTICAL ANALYSIS

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Received: February 05, 2024; Revised: May 14, 2024; Accepted: July 02, 2024

## Abstract

Concrete is considered a durable and strong material. Concrete is an admired material in construction and is consumed in high volume in India as well as globally. Fly ash being a by-product of coal burning is also produced in high quantities from the steel and thermal power sector of India. This research is based on utilizing the waste material in concrete as a restricted substitution of cement, finding a suitable mix that shows healthy mechanical properties for strength, durability, and workability, and validating test results with ANOVA statistical analysis. Low strength M20 and M25 concrete mixes were designed as per IS10262-2019 code guidelines and treated as a base mix. Cement was substituted with varying percentages of fly ash, ranging from 10% to 30%. These mixes were tested for compression and tension by casting 90 samples of cubes and cylinders of standard sizes and further testing. Test results suggest that restricted substitution of cement by Fly ash up to 20% shows a positive response. ANOVA test results were in line with the experimental data.

**Keywords:** ANOVA; Cement Replacement; Durability; Fly ash; Mechanical Properties; Statistical Analysis

## Introduction

The construction industry plays a major role in developing nations and the government spends a huge amount on building the nation like bridges, buildings, dams, etc. The approximate requirement of concrete is 12 billion tons every year. At present, 4,100,000 thousand metric tons of cement are produced every year, which constitutes nearly 5% of the total human-made emissions that lead to global warming (Singh *et al.*, 2017). In the Indian scenario, the consumption of cement has increased by 64.78%

in the past decade from 230 million metric tons (2012) to 379 million metric tons (2022) and will further increase in decades to come (Central Electricity Authority, 2021). The trend of usage is shown in Figure 1.

Therefore, the utilization of Portland Pozzolana Cement (PPC), which consists of 30% fly ash, can offer a possible solution to reducing the use of cement and the cost of concrete.

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DOI: <https://doi.org/10.55766/sujst-2024-04-e03499>

Suranaree J. Sci. Technol. 31(4):010317(1-9)